IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 12, December 2015

Workload Distribution Technique in Virtualized Data Center Using Consolidation and Migration

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Abstract: To increase the efficiency of energy in data center server consolidation technique is used but due to this technique workload performance degraded .So to improve workload performance we used consolidation and migration in virtualized data center. In consolidation technique minimize the number of physical machine(PM)and maximize the number of virtual machine (VM).To increase number of VM VMWARE is used .it create multiple VM on single PM. So, automatically workload distributes and it required less energy for performance. For this purpose two modules are used 1).consolidation planning module, which gives set of workload, minimize the number of PM by an integer programming model 2). Migration planning module which gives workload from consolidation module to VM by Polynomial time algorithm. LSAP(Linear sum assignment problem)this method used to solve migration mapping problem (means during migration from one VM to another it require more communication cost because destination VM already associated with other VM automatically communication cost increase)in this method created matrix solve by using Hungarian algorithm, will get less migration cost.

Keywords: virtual machine, physical machines, consolidation, migration etc.

I. INTRODUCTION

To maintain the energy efficiency for data center infrastructure of data center becomes the most serious problem. Because if infrastructure become large energy requirement also increases. If energy increases costing also increase and to handle such large infrastructure also tedious job it create complexity. According to survey of the New York time in 2012 on energy consumption on data center. They observe that only 6 to 12 percent of electricity used to perform operation on data center other remaining electricity was totally wasted on infrastructure of data center.

If we consider the example of cloud same problem arrives to handle large information large infrastructure require. So, it automatically increases the costing. The disadvantage of this it leads high energy bills, but also increases the high cooling cost; floor space cost and because the adverse impact on the environment.

Server consolidation supported by virtualization as per P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R. Neugebauer, I. Pratt, and A. Warfield [4] main approach to reduce the number of physical machines (PMs) used in data centers to improve energy efficiency. Server consolidation problem with a focus on reducing the performance loss of workloads instead of simply increasing resource utilization. As per C. Clark, K. Fraser, S. Hand, J. Hansen, E. Jul, C. Limpach, I. Pratt, and A. Warfield [5] Virtual machine (VM) migration provides the enabling technology for server consolidation. However, server consolidation and VM migration bring two major challenges:

1) Consolidation can incur considerable performance degradation of co-located VMs due to competition on shared resources such as caches and networks. It is challenging Consolidation may incur significant performance degradation VM co-located due to competition on shared resources such as caches and networks.

2) Migrating virtual machines with different workloads, which will also degrade the performance of workloads.

Paper formulates the problem on how to minimize the number of PMs during server consolidation while guaranteeing the performance loss of each workload. In the migration planning module, we pose a new problem on how to change a current workload placement on PMs into a new workload placement on PMs with minimum number of VM migrations while guaranteeing the performance loss of each workload under certain threshold and By combining the consolidation planning and migration planning modules, we can handle both static and dynamic server consolidations in data centers.

II. RELATED WORK

2.1 L. Barroso and U. Holzle, "The case for energy-proportional computing,"[3] in this paper Energy-proportional designs would enable large energy savings in servers ,potentially doubling their efficiency in real-life use. Achieving energy proportionality will require significant improvements in the energy usage profile of every system component, particularly the memory and disk subsystems. Author compare multiple device and their component and gives which device is more efficient for energy saving. Author also suggest the active low power mode A processor running at a lower voltage-frequency mode can still execute instructions without requiring a performance impacting mode transition. It is still active.

2.2 P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A. Ho, R.Neugebauer, I. Pratt, and A. Warfield, "Xen and the art of virtualization,"[4] in this paper Xen, an x86 virtual machine monitor which allows multiple commodity operating systems to share conventional hardware in a safe and resource managed fashion, but without sacrificing either performance or functionality. Xen design can targeted hosting of up to 100 virtual machine instances simultaneously on a modern server so, due to this cost of communication can reduced. Author also introduces paravirtualization which improved performance, and overcome from drawbacks of cost of increased complexity and reduced performance of system. Author also suggest that full virtualization is not part of X86 for that VMM (virtual monitor) provided.

2.3 C. Clark, K. Fraser, S. Hand, J. Hansen, E. Jul, C. Limpach, I. Pratt, and A. Warfield,[5] "Live migration of virtual machines,"in this paper Migrating operating system instances across distinct physical hosts is a useful tool for administrators of data centers and clusters: It allows a clean separation between hardware and software, and facilitates fault management, load balancing, and low-level system maintenance. Author works on operating system so it is well known as live migration. Migration done in multiple phases from source host to destination host. In this paper pre-copy migration, in this phase it act like the push message phase from source host to targeted host these procedure works in iterative manner that is message sending methods runs in multiple rounds . Every VM will have some (hopefully small) set of message(pages) that it updates very frequently .service degradation will occur because total bandwidth are consume by source and destination during transfer and receive message. After receiving messages or pages to targeted host migration of pages done but still problem occurs how to transfer network devices therefore cluster are used in this NAS are used for migration

2.4 B. Speitkamp and M. Bichler, "A mathematical programming approach for server consolidation problems in virtualized data centers, [6]"in this paper Server consolidation describes the process of combining the workloads of several different servers on a set of target servers This paper presents decision models to optimally allocate source servers to physical target servers while considering real-world constraints. Therefore, besides an exact solution method, a heuristic is presented to address large-scale server consolidation projects. Author also explain static server allocation problem (SSAP) due to this cost of hardware also reduce which is helpful to maintain IT infrastructure .author also mention to keep track of source of workload because the workload can be change.

2.5 T. Ferreto, M. Netto, R. Calheiros, and C. De Rose, "Server consolidation with migration control for virtualized data centers,"[6] in this paper migration control technique are suggested .This paper proposes an LP (linear programming) formulation and heuristics to control VM migration, which prioritize virtual machines with steady capacity. Author explains problem of mapping in migration in both cases 1)static consolidation -in which no migration done 2)dynamic migration –in which migration done these two problem are solved by using LP(linear programming)in which number of physical machines are reduced and number of virtual machines are increased. second solution is heuristics changes the sequence according to first-fit decreasing (FFD), best-fit decreasing (BFD), worst-fit decreasing (WFD), and almost worst-fit decreasing(AWFD)Author performed experiments using TU-Berlin and Google data center workloads to compare migration control strategy against existing eager-migration-based solutions.

2.6 Verma, P. Ahuja, and A. Neogi, "Pmapper: Power and migration cost aware application placement in virtualized systems, [7]"in this paper author describes the architecture and implementation of a power aware application placement framework, called pMapper . In this various technique are provide for power and performance by using virtualization.Pmapper basically used for power minimization under some computation i.e performance constraint. In pmapper the power management action handle in soft actions like CPU idling in the hypervisor, (ii) hard actions like throttling and (iii) consolidation actions (minimize PM). Basically during working of Pmapper 3 manager are used performance manager that take about performance must meet with quality of service, power manager that works regarding power related works and , migration manager that works in virtualization.

2.7X.Liu,C.Wang,B.Zhou,J. Chen,T. Yang,andA.Zomaya, "Priority based consolidation of parallel workloads in the cloud,"[8] In this paper, propose a priority-based method to consolidate parallel workloads in the cloud. author leverage virtualization technologies to partition the computing capacity of each node into two tiers, the foreground virtual machine (VM) tier (with high CPU priority) and the background VM tier (with low CPU priority) and provide scheduling algorithms for parallel jobs to make efficient use of the two tier VMs to improve the responsiveness of these jobs.

In case of energy proportional computing, multiple devices are studied and author suggest which one is better. In energy proportional system active low power mode is also select and author can found that devices gives nice performance without energy wastage. Active low power mode also used to save the energy due to this automatically cost energy consumption is reduced. This method can used in daily life at small scale industry. in Xen system paravirtualization technique invented which reduced the complexity of other virtualization technique also reduced the increase cost .Xen basically hosted multiple VM machine by using the paravirtualization technique .

In live migration it works on operating system so it is well known as live migration .basically it works in multiple phases that are when migration going on the source host can send push sum pages to destination host in particular sequence call Pre-copy migration ,this procedure can run in iterative manner called round. In live migration

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technique also suggests to migrate the network devices in cluster by using NAS (network attached storage). In mathematical program of consolidation decision models are used for migration between the source hosts to destination host by considering real world rules.

Some system also used the linear programming method for and heuristics to control the migration it also suggest the static consolidation and dynamic consolidation. The Pmapper system provide 3 manager are provide performance manager that take about performance must meet with quality of service, power manager that works regarding power related works and , migration manager that works in virtualization.

III. PROPOSED SYSTEM

In our Existing system the workload assigns to migration plan and according to size of workload VM is assign but sequentially .but in proposed system best VM (exact size of VM) allocate to workload. As shown in following diagram our proposed system shows which is combination of static as well as dynamic consolidation.

In our proposed system the energy lost problem also recovers. As shown in following diagram in migration plan module one Physical machine (PM) of size 1000kb Present. In that PM we can make 3 virtual machine that is VM size of 100kb, 300kb, and 500kb respectively.

So, when workload arrived as a input to PM in migration module. The best VM is assign to arrive workload. It basically follows the best fit approach instead of first come first serve approach. So, automatically space of VM is save.

We also used LSAP method to solve the migration mapping problem which is arrived during migration. In LSAP method Hungarian algorithm also used in which the problem is divided into sub-problem.

- LSAP method – The original model where n items (e.g. jobs) are to be assigned to n machines (or workers) in the best possible way.

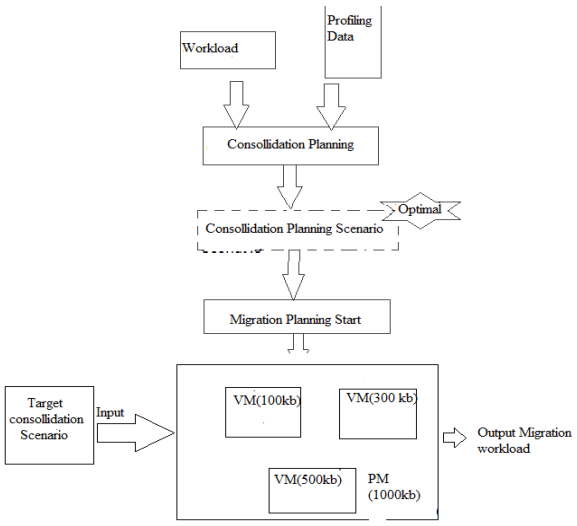

Fig -1: Proposed System

It's assumed that the assignment of the job i to the machine j cost cij .Based in this description the LSAP can be formulated as:

$$\text{Min} \sum_{j=1}^{n} \sum_{i=1}^{n} \text{cijxij}$$

IV. CONCLUSION

The proposed system gives information related to workload distribution by using the migration and consolidation technique. The main purpose of system is to increase the efficiency of system as well as to reduced cost required to manage the data. Also to handle such large data big infrastructure is required and big infrastructure required large power supply.

So the main approach of this system to reduced the number of physical machine by using the virtual machine this technique basically used in consolidation. In migration workload can distribute from one VM to another VM but in this cost of migration increase to solve this problem LSAP (linear sum assignment problem) method used. In LSAP method Hungarian algorithm used. By using this will get less migration cost

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